CLAIMS

1. A method for quantitatively evaluating a graphite structure of a gray cast iron by an image analysis apparatus, characterized by comprising the steps of

5   analyzing a magnified image of the graphite structure, thereby extracting non-spherical graphite pieces of a particular size class contained in the graphite structure to calculate the number and areas of the non-spherical graphite pieces;

      calculating a thick and thin degree expressing a degree

10 of thickness of the non-spherical graphite pieces based on the number and the areas; and

      outputting the number and the thick and thin degree of the non-spherical graphite pieces in combination as an evaluation result.

15 2. The method for evaluating a graphite structure of a gray cast iron according to claim 1, characterized in that the magnified image for the image analyzing step is taken from a microscopic screen image of the graphite structure by an image pickup device.

20 3. The method for evaluating a graphite structure of a gray cast iron according to claim 1 or 2, characterized in that the non-spherical graphite pieces are extracted to calculate the number thereof based on a diameter of a circle having an area equal to that of each graphite piece or on a maximum length of

25 each graphite piece.

4. The method for evaluating a graphite structure of a gray cast iron according to any one of claims 1 to 3, characterized in that the smallest graphite piece of the non-spherical graphite pieces extracted to calculate the number thereof has a size of

30 an area equal to that of a circle having a diameter of 5 μm or a maximum length of 10 μm.

5. The method for evaluating a graphite structure of a gray cast iron according to claim 4, characterized in that the smallest

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graphite piece of the non-spherical graphite pieces extracted to calculate the number thereof has a size of an area equal to that of a circle having a diameter of 5 μm.

6.   The method for evaluating a graphite structure of a gray cast iron according to any one of claims 1 to 5, characterized in that the magnified image is preprocessed. to except and eliminate graphite pieces in contact with a frame of the magnified image before extracting the non-spherical graphite pieces of the particular size class, and

the number of the extracted non-spherical graphite pieces of a particular size class is corrected by the steps of

counting the graphite pieces to be excepted and eliminated;

classifying graphite pieces other than the graphite pieces to be excepted and eliminated into a plurality of size classes containing the particular size class, to count a number of the other graphite pieces of each size class; and

distributing the graphite pieces to be excepted and eliminated into the size classes proportionally based on a ratio between the numbers of the other graphite pieces, to add a number of the distributed graphite pieces to the numbers of the other graphite pieces.

7.   The method for evaluating a graphite structure of a gray cast iron according to any one of claims 1 to 6, characterized in that the total area of the extracted non-spherical graphite pieces is divided by the total number thereof to obtain the thick and thin degree.

8.   The method for evaluating a graphite structure of a gray cast iron according to any one of claims 3 to 7, characterized in that graphite pieces having a maximum length of 50 μm or more and less than 150 μm are selected from the extracted non-spherical graphite pieces, maximum lengths and areas of the selected graphite pieces are measured, and an area of a graphite piece having a maximum length of 100 μm is calculated based on the

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measured data and divided by 100, to obtain the thick and thin degree of a representative graphite piece of the graphite structure.

9. A computer-readable recording medium storing a program for carrying out the steps recited in any one of claims 1 to 8.

10. A system for quantitatively evaluating a graphite structure of a gray cast iron by image analysis, characterized by comprising an image analysis unit, an image input unit for inputting a magnified image of the graphite structure into the image analysis unit, and a display unit for indicating an analysis result,

wherein the image analysis unit comprises a graphite piece number/area calculating unit for analyzing the magnified image of the graphite structure, thereby extracting non-spherical graphite pieces of a particular size class contained in the graphite structure to calculate the number and areas of the non-spherical graphite pieces, and a thick and thin degree calculating unit for calculating a thick and thin degree expressing a degree of thickness of the non-spherical graphite pieces based on the number and the areas, and

the number and the thick and thin degree of the non-spherical graphite pieces are visually indicated on the display unit in combination as an evaluation result.

11. The system for evaluating a graphite structure of a gray cast iron according to claim 10, characterized in that the smallest graphite piece of the non-spherical graphite pieces extracted to calculate the number thereof has a size of an area equal to that of a circle having a diameter of 5 µm.

12. The system for evaluating a graphite structure of a gray cast iron according to claim 10 or 11, characterized in that the magnified image is preprocessed to except and eliminate graphite pieces in contact with a frame of the magnified image before extracting the non-spherical graphite pieces of the particular

size class, and

the image analysis unit comprises a unit for correcting the number of the extracted non-spherical graphite pieces of the particular size class by the steps of

5   counting the graphite pieces to be excepted and eliminated;

classifying graphite pieces other than the graphite pieces to be excepted and eliminated into a plurality of size classes containing the particular size class, to count a number of the other graphite pieces of each size class; and

10   distributing the graphite pieces to be excepted and eliminated into the size classes proportionally based on a ratio between the numbers of the other graphite pieces, to add a number of the distributed graphite pieces to the numbers of the other graphite pieces.

15   13.   The system for evaluating a graphite structure of a gray cast iron according to claim 11 or 12, characterized in that graphite pieces having a maximum length of 50 μm or more and less than 150 μm are selected from the extracted non-spherical graphite pieces, maximum lengths and areas of the selected

20   graphite pieces are measured, and an area of a graphite piece having a maximum length of 100 μm is calculated based on the measured data and divided by 100, to obtain the thick and thin degree of a representative graphite piece of the graphite structure.

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